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Spine (Phila Pa 1976)

The Association between Body Mass Index (BMI) and Back or Leg Pain in Patients with Spinal Conditions: Results from the Genodisc Study

--Manuscript Draft--

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The Association between Body Mass Index (BMI) and Back or Leg Pain in Patients with Spinal Conditions: Results from the Genodisc Study

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The Genodisc Study was conducted in accordance with the ethical standards of United Kingdom National Research Ethics Service (ethical approval number in the UK 09/H0501/95) and with the Helsinki Declaration of 1975, as revised in 2000. The study was also approved by local Research Ethics Committees in each recruiting country.

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ABSTRACT

Study design: Prospective observation study

Objective: To identify the relationship between obesity, quantified by body mass index (BMI), and both back and leg pain in spinal patients.

Summary of Background Data: Obesity and back pain are massive public health problems. Given the poor correlation between pain and an pathological change in the spine in the spine, further investigation is required into other, non-pathological, predictors such as obesity.

Methods: The Genodisc Study was one of the largest cross-sectional studies of patients presenting to tertiary spinal units and recruited from six centres in four European countries. In total, 2636 patients were recruited over a 5-year period between 2008 and 2013. Both back and leg pain were scored by patients in the range of 0 to 10. Linear regression was used to model the relationship between BMI and pain. Potential confounders included in the model were: age, Zung Depression score, episodes of sport, gender, disability benefit, family history, previous surgery, smoking status, work type, clinical diagnosis and relevant co-morbidities. Back and leg pain outcomes were modelled separately.

Results: The study included 1160 men and 1349 women with a mean age of 50.9 years and mean BMI of 27.2kg/m^2. In our fully adjusted model, a 5-point increase in BMI was associated with greater leg (0.19 units [95% CI 0.08,0.31]) but not back (0.10 units [95% CI -0.02,0.22]) pain scores. Although this relationship was statically significant, given the small magnitude of the relationship, the clinical significance is limited. Similarly, female gender, heavy workload, rheumatoid arthritis, previous spine surgery and depression were associated with higher back and leg pain.

Conclusion: In this large observational study of spine patients presenting to tertiary European centres, obesity, as measured by increased body mass index, was associated with greater leg pain.

Key Words: low back pain; sciatica; leg pain; obesity; body mass index; epidemiology

Key Points (3-5 main points of the article)

KEY POINTS

1. An increase in BMI was associated with higher back (non-significant) and leg pain (significant) scores.
2. Other factors that were associated with greater BP or LP were female gender, previous spine surgery, heavy workload, rheumatoid arthritis and depression.
3. Back pain was associated with a greater number of significant predictors than LP possibly because it is an umbrella term for poorly defined conditions.

MINI ABSTRACT

The analysis of 2636 patients presenting to tertiary European spine centres showed an increase in BMI was associated with higher back (non-significant) and leg pain (significant) scores. Other factors that were associated with greater BP or LP were female gender, previous spine surgery, heavy workload, rheumatoid arthritis and depression.

INTRODUCTION

Obesity and back pain are massive public health problems. The 2010 Global Burden of Diseases Study found low back pain to be the leading cause of disability worldwide with a global point prevalence of 9.4-11.9%.[1, 2] As an outcome of the Global Burden of Diseases Study, there has been an urgent call for further research to understand the predictors of low back pain.[1, 3]

Given the poor correlation between pain and an pathological change in the spine in the spine,[4] further investigation is required into other, non-pathological, predictors such as obesity. From population-based studies, it has been established that BMI increases the odds of low back and leg pain.[5, 6] However, these studies consider pain as a binary outcome and provide little information for the effect of obesity upon the severity of pain. Furthermore, there is limited information as to the relationship between BMI and pain in the patient population seen in a tertiary care setting. It is important to understand the contributors to back and leg pain in this population, as these are the patients who present to surgeons, rheumatologists and physiotherapists daily.

The primary aim of our study was to define a relationship between obesity and both low back (BP) and leg pain (LP) scores separately in a large population of patients presenting to tertiary spine centres. We also present data on other predictors of low back and leg pain.

PATIENTS AND METHODS

Genodisc Study Design

Patients were recruited as part of the pan-European Genodisc study[7] All patients presenting to six tertiary spine care centres in four countries; UK, Hungary, Slovenia and Italy, were invited to participate. In total, 2636 patients were recruited over a 5-year period (2008-2013).

Pain Scores

The Genodisc Participant Survey collected patient reported information for both back and leg pain. It specifically asked participants to rate their pain experienced in the preceding week and score it on an scale ranging from 0, meaning no pain, to 10 being the worst pain imaginable. Back pain was defined as pain in the lower back. Participants were asked to score LP that went below their knee, in an attempt to differentiate true radicular LP from other causes, such as hip osteoarthritis.

Other Participant Data

Demographic and patient reported information including age, gender, height and weight (from which BMI was calculated), co-morbidities, smoking status, occupation, family history, previous surgery and disability benefit were also collected. As an assessment of mood, participants were also asked to complete the Zung Self Reported Depression Score (Zung).

Statistical Methods

Stata 13.1 (Stata, College Station, Tx, USA) was used for all statistical analysis. Univariate analysis was initially performed. For the multivariate models, the predictor variable was BMI. The outcome variables, BP and LP scores were modelled separately as continuous variables. Other confounders included in the model were age, Zung Depression score, number of sporting activities per week, gender, disability benefit, family history, previous surgery, smoking status, work type, clinical diagnoses (disc herniation, spinal stenosis, spondylolisthesis and non-specific back pain) and co-morbidities (rheumatoid arthritis, osteoarthritis, osteoporosis, fibromyalgia, migraine, irritable bowel syndrome, anxiety, hypertension, diabetes and cancer). Multiple imputation has been shown to be a valid method in overcoming missing data [8] and was used to overcome incomplete data.

RESULTS

Table 1 describes the Genodisc population which contained information on 2636 patients. BMI was normally distributed with a mean of 27.11kg/m^2. The median (interquartile range [IQR]) duration of symptoms was 10 (4-24) months for BP and 8 (3-20) months of LP. Underweight (BMI<18 kg/m^2) and morbidly obese (BMI>35 kg/m^2) patients presented after a longer duration of both back and leg pain when compared to other patients (Figure 1a).

Increasing BMI was associated with higher unadjusted BP and LP scores (Table 2). It is important to note the marked increase in the prevalence of hypertension and diabetes with increasing BMI.

Table 3 shows the main result of the univariate and multivariate linear regression models. Multivariate adjusted model 1 for BP shows that a 5-point increase in BMI was associated with a non-significant increase in BP score of 0.20 units (95% CI -0.02, 0.22). However in the univariate model, this association was significant. To investigate where this relationship was lost in our multivariate model, we sequentially removed individual confounders. When hypertension and diabetes were removed (Back pain multivariate adjusted model 2), the effect of BMI upon BP remained significant at 0.15 units (95% CI 0.04,0.27) with minimal change to the coefficients of the other confounders.

In the multivariate model for LP, a 5-point increase in BMI was associated with a 0.19 unit (95% CI 0.15,0.31) increase in pain (Table 3). There was very little change in this effect with the removal of hypertension and diabetes from our regression model (Leg pain multivariate adjusted model 2;Table 3). Figure 2 graphically represents the adjusted linear effect of increasing BMI upon back and leg pain.

The regression coefficients with associated confidence intervals from multivariate model for both back and leg pain are illustrated in Figure 3. Female gender, depression (Zung Depression Score),

rheumatoid arthritis, heavy workload and previous surgery were all significant positive predictors of both increased BP and LP. Sport was a significant negative predictor for both BP (-0.07 [95% CI -0.14,-0.01]) and LP (-0.10 [95% CI -0.14,-0.04]). Specifically, for BP, the strongest positive predictors were receiving benefit for disability (0.67 units [95% CI 0.30, 1.04]), a heavy workload (0.67 units [95% CI 0.33,1.01]) and rheumatoid arthritis (0.72 units [95% CI 0.33,1.11]). By contrast, the strongest association for LP was a diagnosis of lumbar disc herniation (1.08 units [95% CI 0.84,1.33]).

DISCUSSION

In this large group of spine patients presenting to European tertiary spinal units, an increase in BMI was associated with higher back (non-significant) and leg pain (significant) scores (Figure 2 and Figure 3). Other factors that were associated with greater BP or LP were female gender, previous spine surgery, heavy workload, rheumatoid arthritis and depression (Zung Depression Score) (Figure 3). It is important to note that due to the cross-sectional nature of this study, we can only infer associations not causation.

Back pain was associated with a greater number of significant predictors than LP possibly because it is an umbrella term for poorly defined conditions (Figure 3). Leg pain, below the knee, however, usually has an underlying disc herniation. This is supported in the LP model, where the diagnosis of disc herniation had a strong positive association increasing LP score by 1.08 units (95% CI 0.84,1.33) (Figure 3).

In our analysis, when we considered hypertension and diabetes as confounders, we found that the effect of BMI upon BP score, but not LP score, was markedly weakened with minimal change in any of the other confounders.

The relationship between the cardiovascular risk factors and spine related pain is unclear as it is difficult to identify a direct effect of hypertension and diabetes upon back and leg pain. Certain authors have described an atherosclerotic hypothesis to explain a causal relationship between hypertension and diabetes and BP. This relationship has been established primarily in cadaveric studies[9, 10] and also in an occupation-based epidemiological study.[11] Within this occupational study, the authors showed that over a 28-year period patients with higher blood pressure at baseline had increased risk of BP. This could explain why hypertension and diabetes only confound the relationship between BMI and BP, and not LP.

It is well recognised that both hypertension and diabetes are associated with obesity as part of the metabolic syndrome. Our data supports a positive association between increasing prevalence of both diabetes and hypertension with increasing BMI (Table 2). Given this, we believe, these confounders most likely lie on the causal pathway between obesity and BP and hence adjusting for these may not be appropriate. As such we interpret the effect of hypertension and diabetes to be primarily related to BMI.

A recent meta-analysis, by Shiri et al found that people with increased BMI had greater odds of developing BP, increased prevalence of BP and were more likely to have chronic BP.[6] Importantly, this relationship was dose dependant, with obese people having higher levels of pain than those who were overweight. Another recently published meta-analysis, by the same group, showed a similar dose dependant relationship between increasing BMI and self reported LP symptoms.[5] A limitation of these meta-analyses and of the original studies is that both BP and LP were considered as binary "yes/no" variables. Our study adds to this by showing a similar relationship exists in BP and LP for patients seeking tertiary care and by providing a more detailed understanding on the effect of BMI upon the severity of both BP and LP.

Shiri also noted that overweight or obese patients were more likely to "seek care" for their BP.[6] Based on this information we would have expected our group of patients to have a higher BMI than the general population. However, when we compare the mean BMI within our population (27.2 kg/m^2) to those reported in population based studies such as the English Longitudinal Study of Aging (27.9 kg/m^2),[12] the United Kingdom Biobank (27.4 kg/m^2)[13] or a large Hungarian cohort (25.9 kg/m^2),[14] there are minimal differences. This is important, as although overweight and obese people from the study of Shiri et al[6] appear more likely to seek primary care, based on the mean BMI in this study, it appears that these patients do not filter through to tertiary care. It seems unlikely that this is because their symptoms are less severe as we have found increased BMI is associated with more severe pain (Figure 2) and also with longer duration of pain symptoms, suggesting a longer period before tertiary care consultation (Figure1a). A hypothetical explanation could be negative institutional attitudes for the health care of the obese[15] could possibly lead to restriction in their access to tertiary level care for back and leg pain, similar to that seen in osteoarthritis.[16]

Our findings for BP are similar to those of Fanuele et al, who, though not looking at pain directly, used the American National Spine Network data to model the effect of BMI upon disability arising from low back pain.[17] Here, the authors found that obesity was associated with decreased functional status and increased disability. Unfortunately, given the nature of their dataset the authors were not able to correct for depressive symptoms, a significant confounder in our study, nor did they consider LP as an outcome in their adjusted model. Similarly, Heuch et al recently showed, in a longitudinal study, that a BMI of greater than 30kg/m^2 increases the odds of developing BP, further supporting the deleterious relationship between obesity and BP.[18]

As there appears a direct relationship between BMI and the severity of pain (Figure 2); the next question we must ask is if weight loss help reduce the pain. Recently, three separate small case-series of back pain patients have found that post bariatric surgery with resulting rapid weight loss, obese patients have less BP[19-21] and reduced spine related disability.[19, 20] Surgical weight loss represents an extreme form of weight loss and is a treatment that may not be widely available but the results support the idea that weight loss could lead to decreased pain and this requires further investigation.

As well as weight loss, our results suggest that exercise is associated with less back pain (Figure 3). Within a population setting, Smuck et al, in addition to finding a dose dependant increase of BP with BMI, showed that moderate physical was protective from back pain in an overweight and ultraobese population, but not in the obese group.[22] However, when BMI was considered continuous, this study found physical activity conferred only a small protective effect. The Nord-Trøndelag Health study also found a small protective effect of physical activity upon back pain.[18] To an extent, these results are in keeping with our study where lower BP and LP scores were associated with greater physical activity (Figure 3). More specifically, the greatest decrease in pain score was noted between patients involved in only one episode of sport a week as compared to those who did none (Figure 1b). Similarly, with increasing BMI the associated number of episodes of sporting activity decreases suggesting these patients are less likely to partake in potentially beneficial exercise (Table 2). Alternatively, patients with greater pain may be less willing to exercise so whether exercise is protective cannot be fully assessed from this cross-sectional data.

The link between obesity and pain is usually thought to be mechanical but biochemical pathways may also operate. Obesity is known to cause a systemic low grade inflammatory milieu and there is growing evidence that there is a biochemical link between obesity, degeneration of musculoskeletal tissues and pain.[23] Leptin, the prototypical adipokine, is reported to increase the synthesis of pro-

inflammatory cytokines, pain generators and destructive mediators in a knee osteoarthritis model.[24, 25] Adipokines can elicit a similar response in the intervertebral disc, the primary joint of the spine[26] as well as altered pain behaviour in a lumbar nerve root compression model.[27]

Obesity has also been implicated or associated in other pain and psychiatric disorders such as fibromyalgia,[28] migraines[29, 30] and depression.[31, 32] For patients with depression and migraine headaches, a similar dose dependant relationship of increasing BMI with greater symptoms is seen.[29, 30, 32] This linear relationship is less clear in fibromyalgia with authors suggesting an important relationship between obesity, physical activity and symptoms.[28] Furthermore, altered adipokines have also been associated with migraine headaches[30] and fibromyalgia.[33] Taken together, this would suggest increased BMI is an important mediator in main pain related disorders and the effect could be mediated by systemic rather than local mechanisms.

The Genodisc Study is one of the largest populations of patients suffering from spinal conditions with prospectively collected data in a standardised format. As a result, the study carries considerable power and enables us to adjust for many potential participant and clinician reported confounders without limiting the validity of our results. We believe our results are generalisable within the tertiary care setting as patients were recruited from six sites in four countries with a resulting heterogeneous population.

The cross sectional nature of this study raises three important caveats when interpreting the results. Firstly, we cannot establish causation, however within the general population, there is evidence that obesity may be a factor directly leading to back and leg pain.[6, 18]

Secondly, the clinical relevance of these findings requires discussion. For the numerical pain rating scale, as used in this study, a reduction of two points or 30% is generally accepted as a clinically

meaningful difference.[34, 35] From our study, even a very large 15 kg/m^2 increase in BMI would not show a clinically meaningful difference in pain score. The small coefficients seen in our study may be statistically enhanced by the large sample size.

Although, the definition of a clinically important difference was derived from chronic pain populations including patients with low back and neuralgic pain, it is important to note that such difference represents a change in pain score, which is usually an intra-individual change within a longitudinal cohort or interventional study. Even though our population is similar, the interpretation of clinical relevance is most likely informative rather than prescriptive in our observational study. Similarly, our findings are consistent to what is seen in the literature suggesting a true result rather than a statically anomaly.

Finally, pain is a symptom, which is not constant and can change because of factors other than those relating to a biological or pathoanatomical process. Although we attempted to acquire a more general picture of pain symptoms by asking participants to rate their pain over the previous week, longitudinal studies are required to answer the question of causation.

CONCLUSION

This study provides evidence supporting the hypothesis that obesity is independently associated with leg pain and that the effect of increasing BMI upon pain is linear. It also provides information on other clinically important predictors of pain in spine patients, in particular female gender, heavy workload, rheumatoid arthritis, previous spine surgery and depression. Given the growing evidence for a relationship between obesity and both back and leg pain, we need to move forward to understand the underlying biological pathway and also to define evidence-based management modalities for obese patients with spinal conditions.

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TABLES

Table 1: Characteristics of the Genodisc participants. Data are n (%), mean (standard deviation [SD]) or median (interquartile range [IQR])

Characteristic:		Missing (n)
Age (years), mean (SD)	50.85 (14.59)	111
Women, n (%)	1349 (53.8%)	127
BMI (kg/m^2), mean (SD)	27.22 (4.80)	169
Pain Score (units), mean (SD)		
Back	6.18 (2.88)	211
Leg	6.66 (2.91)	217
Duration of Symptoms (months), median (IQR)		
Back	10 (4-24)	432
Leg	8 (3-20)	436
Zung Depression Score, mean (SD)	39.83 (9.00)	942
Sport per Week (episodes), median (IQR)	0 (0-2)	133
Disability Benefit, n (%)	296 (12.1)	183
Family History, n (%)	747 (30.3)	172
Previous Surgery, n (%)	715 (27.9)	69
Smoking Status, n (%)		264
Never	1079 (45.5)	
Previous	622 (26.2)	
Current	671 (28.3)	
Work Type, n (%)		234
Sedentary	684 (28.5)	
Light	605 (25.2)	
Medium	563 (23.4)	
Heavy	550 (22.9)	
Clinical Diagnosis, n (%)		
Lumbar disc herniation	1413 (55.5)	90
Spinal stenosis	968 (39.1)	161

Spondylolisthesis			400 (16.3)	186	
Non-specific Back Pain			359 (14.7)	198	
Comorbidities , n (%)				0	
Rheumatoid Arthritis			233 (8.8)		
Osteoarthritis			298 (11.3)		
Osteoporosis			180 (6.8)		
Fibromyalgia			21 (0.8)		
Migraine			381 (14.5)		
Irritable Bowel Syndrome			162 (6.1)		
Anxiety			233 (8.8)		
Hypertension			715 (27.1)		
Type 2 Diabetes Mellitus			214 (8.1)		
Cancer			298 (11.3)		

Table 2: Categorised BMI with unadjusted mean low back pain and leg pain score, participation in sport and prevalence of hypertension and diabetes for each group.

	Underweight (<18.50)	**Normal Weight (18.50–24.99)**	**Overweight (25.00–29.99)**	**Obese (30.00–34.99)**	**Severe Obese (≥35.00)**
Number of Patients	37	780	952	451	153
Back pain score mean (95% CI)	5.35 (4.39,6.31)	6.00 (5.80,6.21)	6.16 (5.98,6.35)	6.24 (5.98,6.50)	7.24 (6.83,7.65)
Leg pain score mean (95% CI)	6.27 (5.10,7.44)	6.42 (6.21,6.64)	6.57 (6.39,6.76)	6.97 (6.72,7.21)	7.70 (7.36,8.03)
Episodes of sport per week mean (95% CI)	1.08 (0.39,1.78)	1.06 (0.93,1.18)	1.01 (0.90,1.12)	1.01 (0.84,1.18)	0.72 (0.48,0.96)
Type 2 diabetes mellitus (%)	0.0	3.9	7.4	15.0	21.3
Hypertension (%)	10.8	14.9	27.6	45.6	53.8

Table 3: Univariate and multivariate regression coefficients for the effect of BMI upon back and leg pain scores. Multivariate model 1 includes hypertension and diabetes as confounders, multivariate model 2 does not. Coefficient is the regression coefficient. Each coefficient represents a change in pain score for a 5-unit increase in BMI. A positive coefficient represents increased pain. Models were fitted to 50 multiple imputation datasets (n=2636). Multivariate model 1 is adjusted for all confounders as described in the main text. In multivariate model 2, hypertension and diabetes were excluded.

	Back Pain Score			**Leg Pain Score**		
	Coefficient	**(95% CI)**	**p value**	**Coefficient**	**(95% CI)**	**p value**
Univariate	0.26	(0.14,0.37)	0.0	0.35	(0.23,0.47)	0.0
Multivariate model 1	0.10	(-0.02,0.22)	0.10	0.19	(0.08,0.31)	0.0
Multivariate model 2	0.15	(0.04,0.27)	0.01	0.22	(0.10,0.33)	0.0

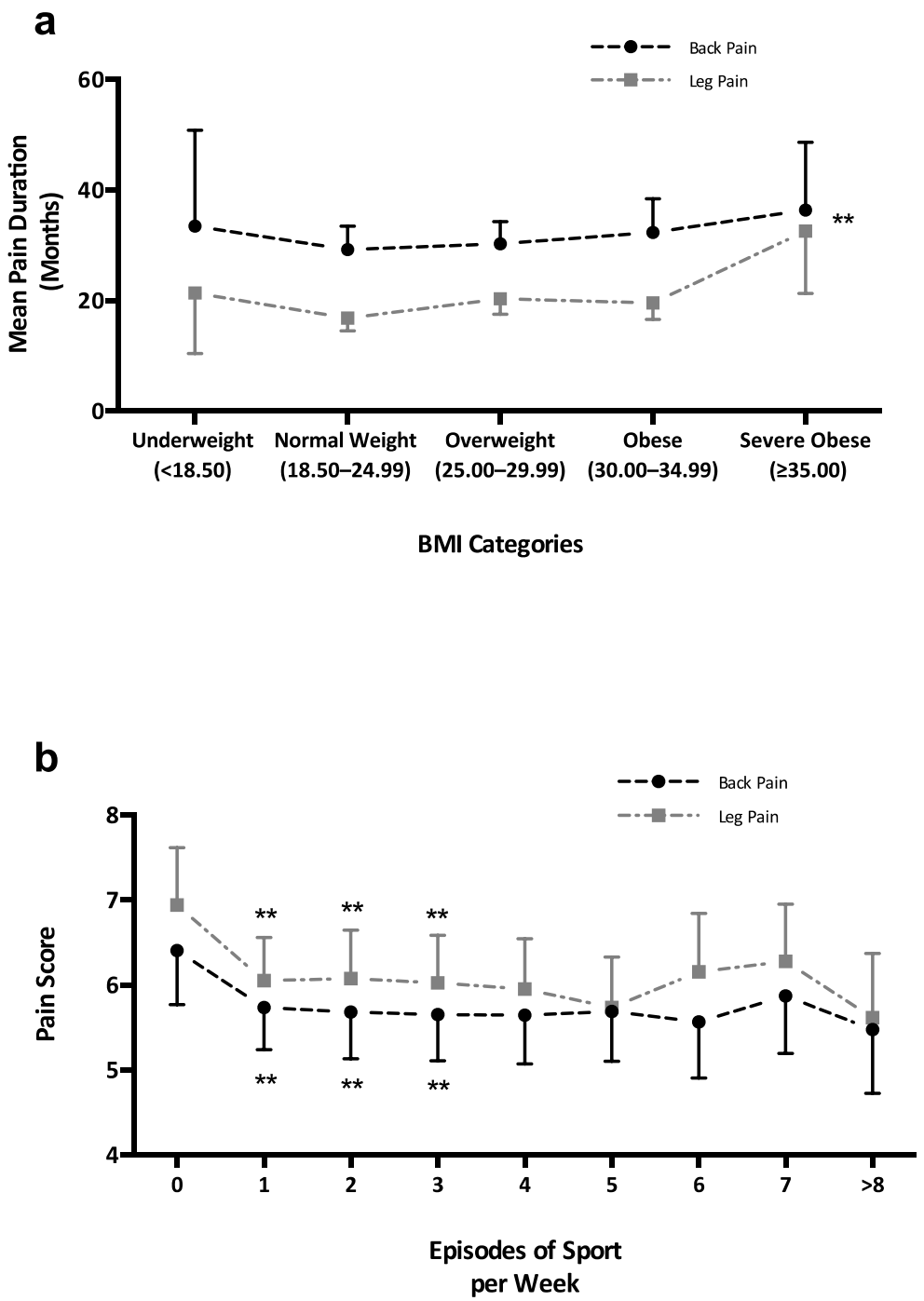
FIGURE LEGENDS

Figure 1: a) Mean duration of pain (months) experienced by patients categorised by BMI (body mass index). b) Mean pain scores categorised by episodes of sport. Markers represent mean and 95% confidence intervals. **p<0.01 when compared to a) normal BMI or b) no sport

Figure 2: Adjusted mean back and leg pain score for each BMI (body mass index) category. Bars show mean and 95% confidence Interval

Figure 3: Confidence interval plots showing regression coefficients of multivariate model 1 (adjusted for hypertension and diabetes) for both the back and leg pain. Models fitted to 50 multiple imputation datasets (n=2636). Coefficient is the regression coefficient. A positive coefficient represents higher pain and a negative coefficient represents lower pain. The solid diamond represents the effect and the error bars the 95% confidence interval. If the confidence interval does not cross the “No Effect” dotted line the predictor is significant.

Figures 1


a
Back Pain
Leg Pain
Mean Pain Duration (Months)
60
40
20
0
**
Underweight (<18.50)
Normal Weight (18.50–24.99)
Overweight (25.00–29.99)
Obese (30.00–34.99)
Severe Obese (≥35.00)
BMI Categories
b
Back Pain
Leg Pain
Pain Score
8
7
6
5
4
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0
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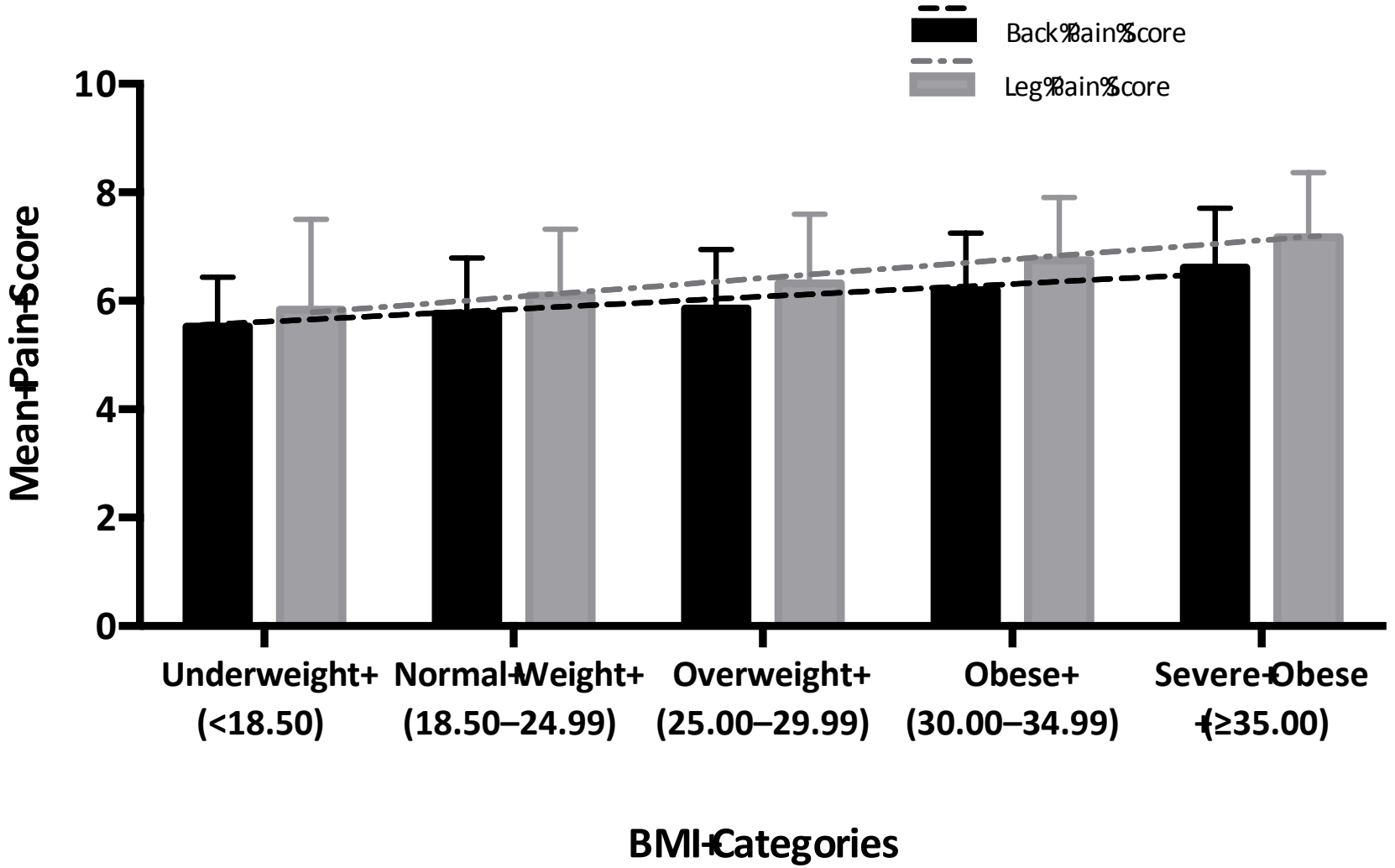
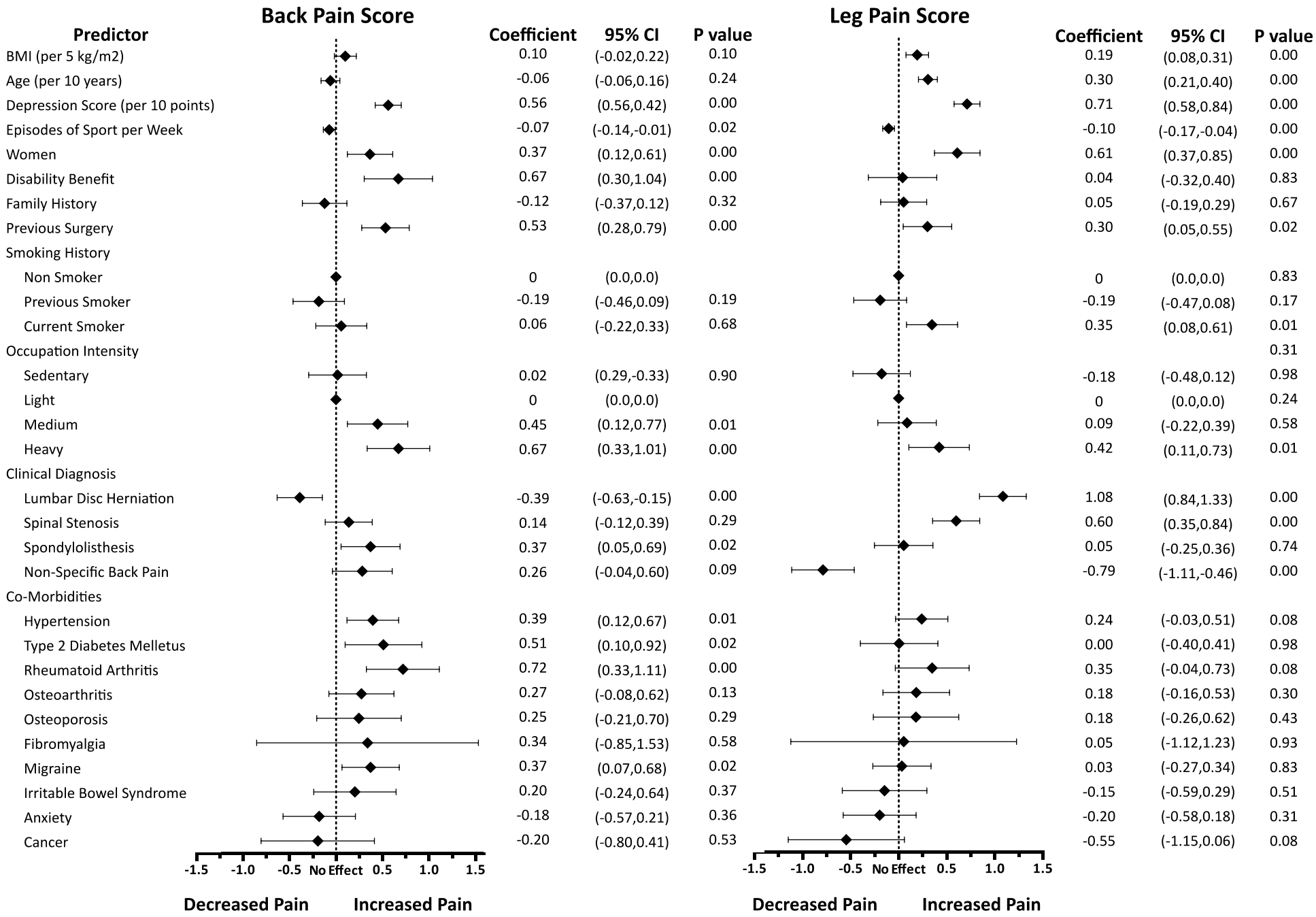
7
>8
Episodes of Sport per Week

Figures 2


Back Pain Score
Leg Pain Score
10
8
6
4
2
0
Mean Pain Score
Underweight (<18.50)
Normal Weight (18.50–24.99)
Overweight (25.00–29.99)
Obese (30.00–34.99)
Severe Obese (≥35.00)
BMI Categories

Figures 3


Back Pain Score
Leg Pain Score
Predictor
Coefficient
95% CI
P value
BMI (per 5 kg/m2) 0.10 (-0.02,0.22) 0.10 0.19 (0.08,0.31) 0.00
Age (per 10 years) -0.06 (-0.06,0.16) 0.24 0.30 (0.21,0.40) 0.00
Depression Score (per 10 points) 0.56 (0.56,0.42) 0.00 0.71 (0.58,0.84) 0.00
Episodes of Sport per Week -0.07 (-0.14,-0.01) 0.02 -0.10 (-0.17,-0.04) 0.00
Women 0.37 (0.12,0.61) 0.00 0.61 (0.37,0.85) 0.00
Disability Benefit 0.67 (0.30,1.04) 0.00 0.04 (-0.32,0.40) 0.83
Family History -0.12 (-0.37,0.12) 0.32 0.05 (-0.19,0.29) 0.67
Previous Surgery 0.53 (0.28,0.79) 0.00 0.30 (0.05,0.55) 0.02
Smoking History
Non Smoker 0 (0.0,0.0) 0 (0.0,0.0) 0.83
Previous Smoker -0.19 (-0.46,0.09) 0.19 -0.19 (-0.47,0.08) 0.17
Current Smoker 0.06 (-0.22,0.33) 0.68 0.35 (0.08,0.61) 0.01
Occupation Intensity 0.31
Sedentary 0.02 (0.29,-0.33) 0.90 -0.18 (-0.48,0.12) 0.98
Light 0 (0.0,0.0) 0 (0.0,0.0) 0.24
Medium 0.45 (0.12,0.77) 0.01 0.09 (-0.22,0.39) 0.58
Heavy 0.67 (0.33,1.01) 0.00 0.42 (0.11,0.73) 0.01
Clinical Diagnosis
Lumbar Disc Herniation -0.39 (-0.63,-0.15) 0.00 1.08 (0.84,1.33) 0.00
Spinal Stenosis 0.14 (-0.12,0.39) 0.29 0.60 (0.35,0.84) 0.00
Spondylolisthesis 0.37 (0.05,0.69) 0.02 0.05 (-0.25,0.36) 0.74
Non-Specific Back Pain 0.26 (-0.04,0.60) 0.09 -0.79 (-1.11,-0.46) 0.00
Co-Morbidities
Hypertension 0.39 (0.12,0.67) 0.01 0.24 (-0.03,0.51) 0.08
Type 2 Diabetes Melletus 0.51 (0.10,0.92) 0.02 0.00 (-0.40,0.41) 0.98
Rheumatoid Arthritis 0.72 (0.33,1.11) 0.00 0.35 (-0.04,0.73) 0.08
Osteoarthritis 0.27 (-0.08,0.62) 0.13 0.18 (-0.16,0.53) 0.30
Osteoporosis 0.25 (-0.21,0.70) 0.29 0.18 (-0.26,0.62) 0.43
Fibromyalgia 0.34 (-0.85,1.53) 0.58 0.05 (-1.12,1.23) 0.93
Migraine 0.37 (0.07,0.68) 0.02 0.03 (-0.27,0.34) 0.83
Irritable Bowel Syndrome 0.20 (-0.24,0.64) 0.37 -0.15 (-0.59,0.29) 0.51
Anxiety -0.18 (-0.57,0.21) 0.36 -0.20 (-0.58,0.18) 0.31
Cancer -0.20 (-0.80,0.41) 0.53 -0.55 (-1.15,0.06) 0.08
-1.5 -1.0 -0.5 No Effect 0.5 1.0 1.5
Decreased Pain
Increased Pain

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